Amendments to the Specification

[0001] This application claims priority to the following provisional patent applications: SN 60/473,075 "Switched-current Power Converter", filed 23 May, 2003; SN 60/477,417 "Fast Transition Power Converter for Processors Using Switched-Current and Switched Charge", filed 9 June, 2003; SN 60/479,706 "Parallel Current Sources for Switched-Current Power Converters", filed 19 June, 2003; SN 60/481,022 "Voltage Control for Switched-Current Power Converters", filed 25 June, 2003; and SN 60/481,414 "Voltage Control for Switched-Current Power Converters, filed 24 September, 2003. U. S Patent No. 4,665,357, "Flat Matrix Transformer", issued on May 12, 1987 and U. S. Patent No. 6,121,761 "Fast Transition Power Supply", Edward Herbert, issued on September19, 2000 are cited as references.

[0011] The control of the constant current buck converter input section is very simple: It can be a hysteretic control. Alternatively, it can be a current mode control, with a fixed current reference.

[0037] Figure 2 shows a prior art multi-phase buck converter 11. A plurality of input switches 13a-13d are pulse width modulated to provide an average voltage equal to the duty cycle times the input voltage V1 to a plurality of inductors 12a-12d. The plurality of inductors 12a-12d and an output capacitor 15 cooperate as an output filter to provide a smooth output voltage Vo. A plurality of catch diodes 14a-14d conduct currents into the plurality of inductors 12a-12d when any of the plurality of switches 13a-13d are open. In modern power converters, the switches 13a-13d and the catch diodes 14a-14d may be MOSFETs, and the duty cycles of the MOSFETs are precisely controlled by sophisticated controller integrated circuits.

[0041] Figure 5 shows a switched-current power converter 41 comprising a quantity m constant current sources 42a-42m, where m is an positive integer. Each of the constant current sources 42a-42m may have an equal constant current I, as an example, not a limitation. As the constant current will depend upon component values that are not precise, "equal" as used in this specification and the claims is not an absolute and allows some variation between the currents.

[0063] Figure 15 shows a well known circuit for incorporating hysteresis. A comparator circuit 151 comprises a comparator 152, a hysteresis feedback resistor 153, a pull up resistor 154 and an input resistor 155. When a voltage Vx rises above the threshold voltage Vref, the output of the comparator goes low. Previously the voltage divider network comprising the resistors R1, R2 and R3 had Vref on both ends, so the voltage at the positive input of the comparator 152 was also Vref (assuming an open output on the comparator and no other sources of leakage current).

[0065] For the purpose of this specification and the claims, a hysteresis feedback resistor is a resistor from the output of a comparator means to its positively referenced input terminal. A comparator means is said to "have hysteresis" if its positive-going threshold voltage is higher than its negative-going threshold voltage. This may be achieved

through the use of a hysteresis feedback resistor. However, some commercially available comparator means have internally generated hysteresis, and the use of such a comparator means is equivalent for the purposes of teaching this invention.